CERFACS

CENTRE EUROPÉEN DE RECHERCHE ET DE FORMATION AVANCÉE EN CALCUL SCIENTIFIQUE

e-infrastructure

is-enes

climate4impact: a tailored IS-ENES web portal providing processing and downscaling services through WPS and interfaced with icclim/ocgis

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www.cerfacs.fr

IS-ENES2: collaborative building

- IS-ENES: 2009-2013 (1st climate4impact operational version 2013)
- IS-ENES2: 2013-2017

IS-ENES2 climate4impact.eu

Main Features (general)

- Dedicated to the climate impact community: based on 21 use cases from e.g, Deltares, Alterra, UvA.
- Dissemination of model results from both global and regional model experiments
- Extensive documentation for impact modelers: guidelines, warnings, do's and don'ts
- Facilitates interaction between climate modelers, companies and climate services
- Search, visualize and compute: from Petabyte to megabyte size reduction, drill down to the information needed, downscaling and indices

Builds on and contributes to ESGF global infrastructure:

ESGF Earth System Grid Federation

CERFACS is-enes

is-enes
INFRASTRUCTURE FOR THE EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING

Exploring climate model data

IS-ENES climate4impact portal

Welcome to the IS-ENES climate4impact portal, oriented towards climate change impact modellers, impact and adaptation consultants, as well as other experts using climate change data.

Here you will find access to data and *quick looks* of global climate models (GCM) scenarios, as well as regional climate model (RCM) and downscaled higher resolution climate data. The portal provides data transformation tooling for tailoring data to your needs and mapping & plotting capabilities.

Guidance on how to use climate scenarios, documentation on the climate system, frequently asked questions and examples in several impact and adaptation themes are presented and described, along with the steps required to go from GCM data to impact model input data.

Latest

- Workshop held on design of scientific portals (Nov 2014, KNMI (NL)) download the presentations

- The climate4impact portal is operational since 15 April 2014: read more.

Click on one of these images to go to a specific climate change impact and adaptation theme.

The IS-ENES project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration.

Disclaimer

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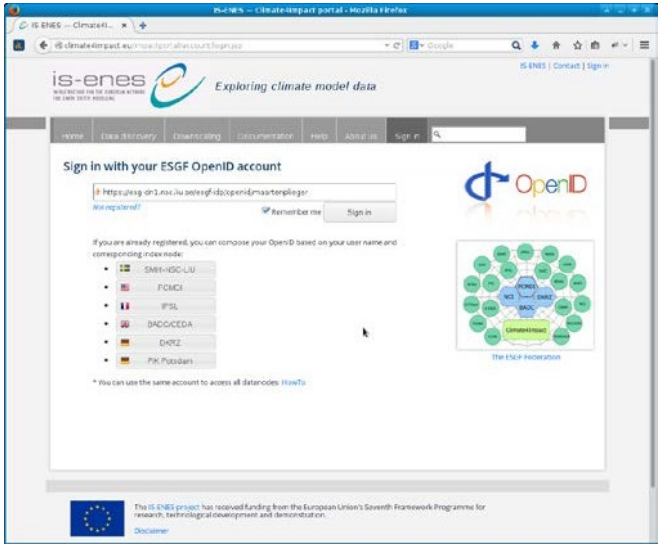
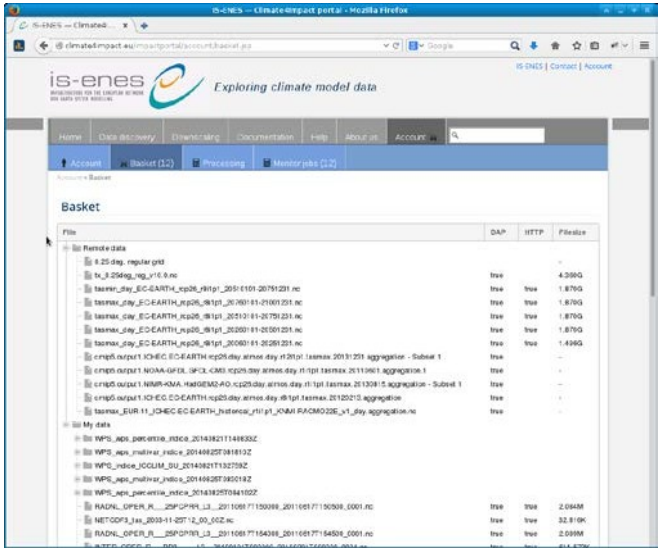
IS-ENES2 climate4impact.eu

Main Features (data access)

- Login with ESGF open id identifier, system helps with OpenID composition: login only once
- Uses x509 client certificates for server side data access
- Search ESGF infrastructure for CMIP5 / CORDEX
- Visualize ESGF data using WMS (ADAGUC)
- WPS processing can be done on files in basket
  - Indices calculation and time series (icclim)
  - Processing results are put in your basket
- Everyone who logs in has a personal basket
  - Upload and store your own data (served by OpenDAP)
  - Visualize your own data online





C4I: Providing Services

climate4impact (C4I) is providing services tailored for the impact community

Adhere to standards as much as possible

- OGC Services
- Metadata: ES-DOC, CF-Convention 1.x

Give easier access to existing datasets

- CMIP5
- CORDEX
- ...

Objectives

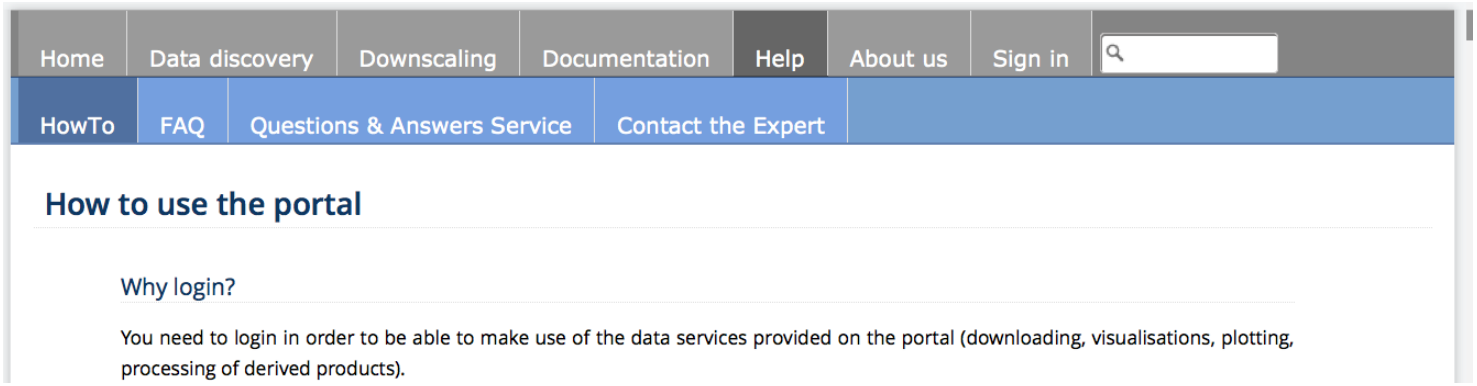
- To support building of community-specific data portals
  - Standard Services
  - Provides services to community's hosted OpenDAP-accessible datasets
  - Common tools
    - Online Statistical Downscaling (University of Cantabria Downscaling Portal)
    - Online/offline simple statistics and climate indices calculations (icclim/ocgis)

C4I: Providing User Services

C4I is providing services tailored for the impact community (cont'd)

More objectives

- To support users of those datasets
  - Comprehensive Documentation (Scientific & Technical)
  - Glossary
  - Experts and Q&A Hotline

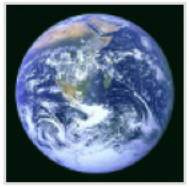


C4I: Providing User Services

Home | Data discovery | Downscaling | Documentation | Help | About us | Sign in

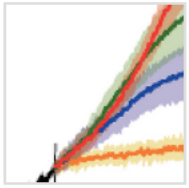
Guidance & use cases | Background & topics | Glossary | Map & Plot | Processing | Publications

Background & topics



General concepts

Some background information on the global climate system.

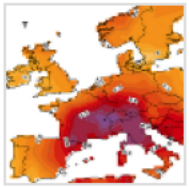


Scenarios

How scenarios are created and used, and what differs them.

Climate models

Information on global and regional climate models.



Climate model data

What comes out of a climate model and how to use it.

C4I: Providing Easier Data Access

C4I provides Easy setup of WMS services

Example: creating a specific map service for your OpenDAP datasets

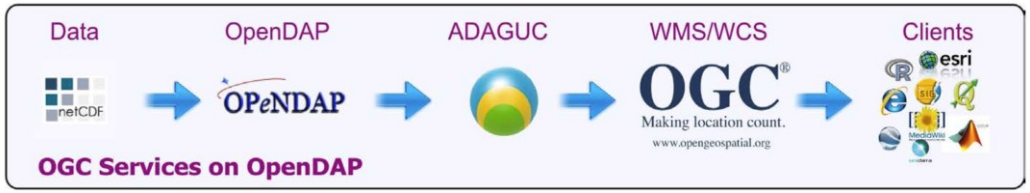
No additional configuration of C4I is needed

A) Use standard names and units of the NetCDF variable (CMIP3/5)

B) Provide your opendap URL as source parameter to the C4I WMS service:

http://climate4impact.eu/impactportal/ImpactService?source=<urlencoded opendap endpoint>&

C) Done!

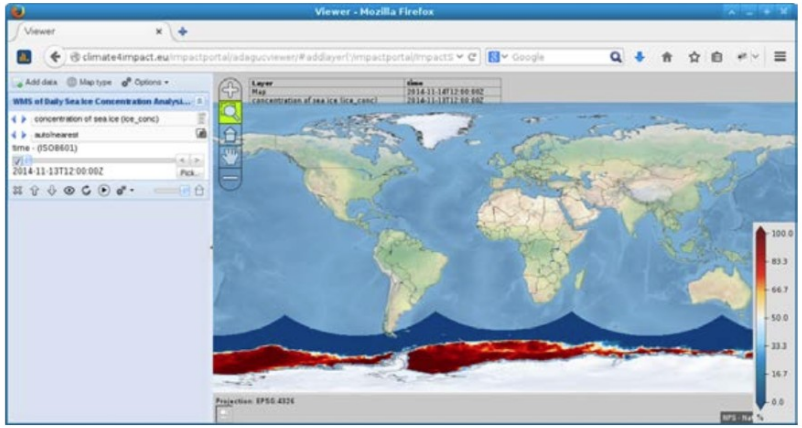


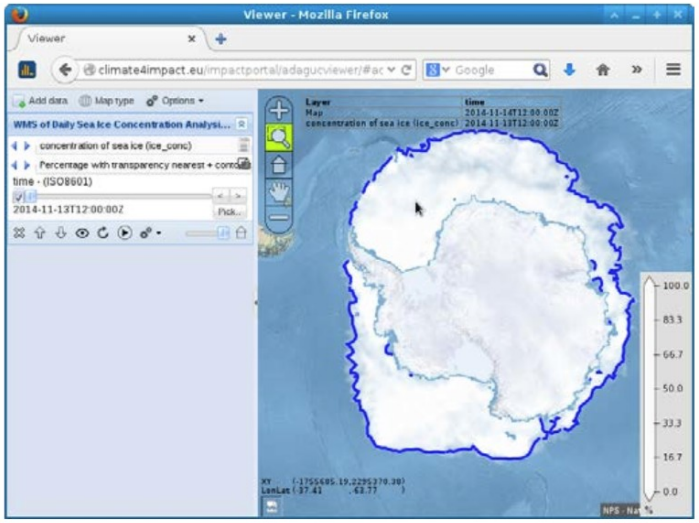
- For the rest, the service remains a standard WMS which works in many WMS clients
- Graphical styling is based on standard names and units of the netCDF variable.

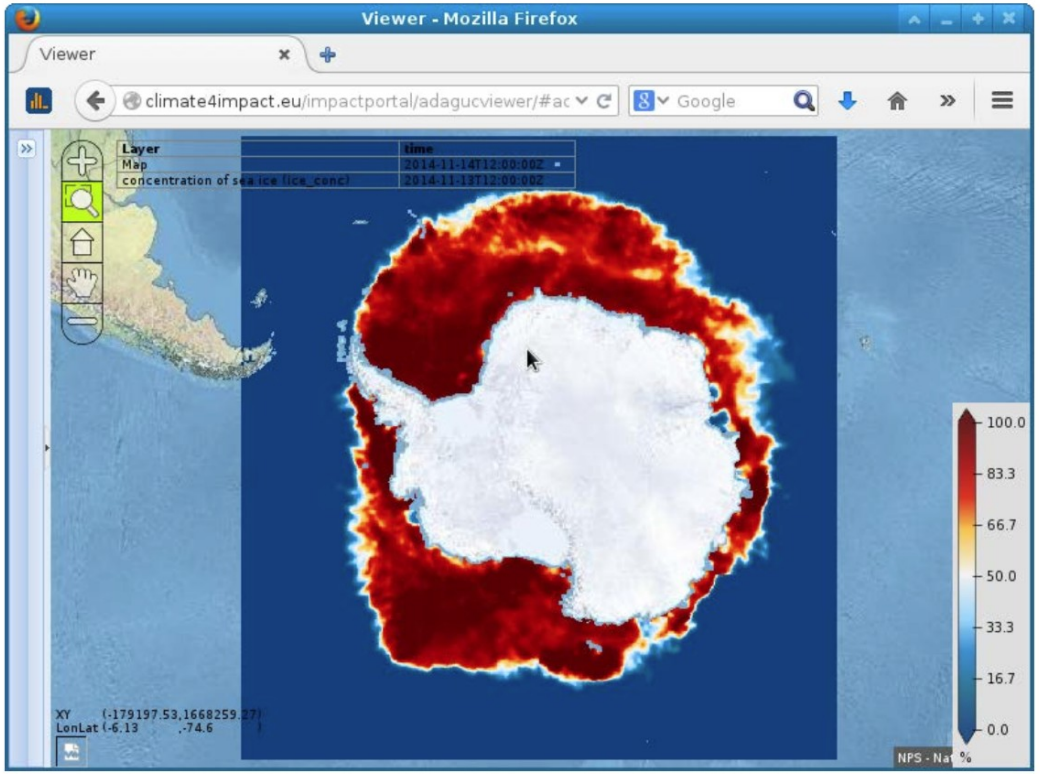
Easy WMS services

EUMETSAT Ocean and Sea ICE SAF from Norwegian Meteorological Institute:

http://met.no/Hav_og_is/English/Access_to_data/
http://thredds.met.no/thredds/catalog/osisaf/met.no/ice/conc/catalog.html
http://thredds.met.no/thredds/dodsC/osisaf/met.no/ice/conc/2014/11/ice_conc_sh_polstere-100_multi_201411131200.nc

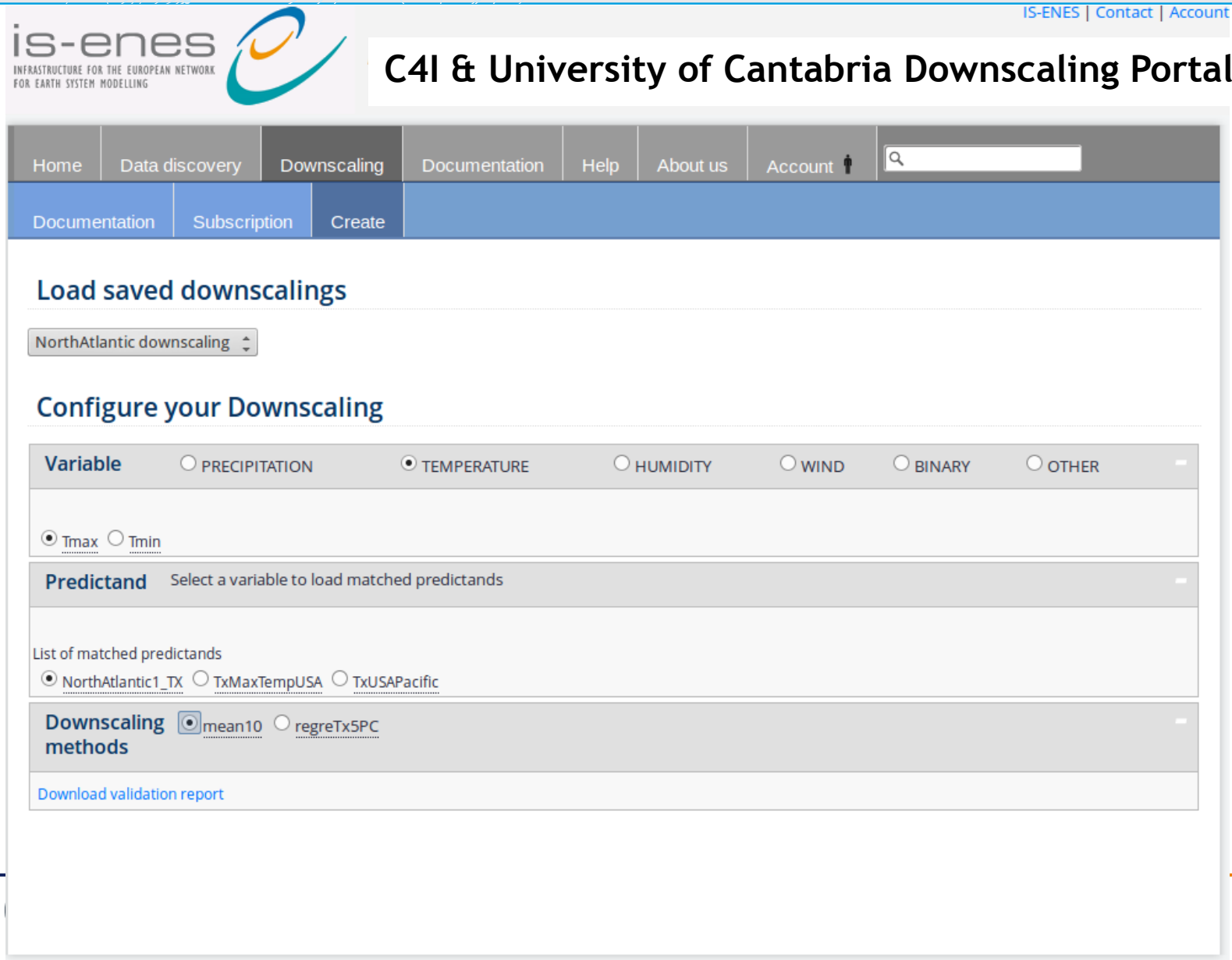




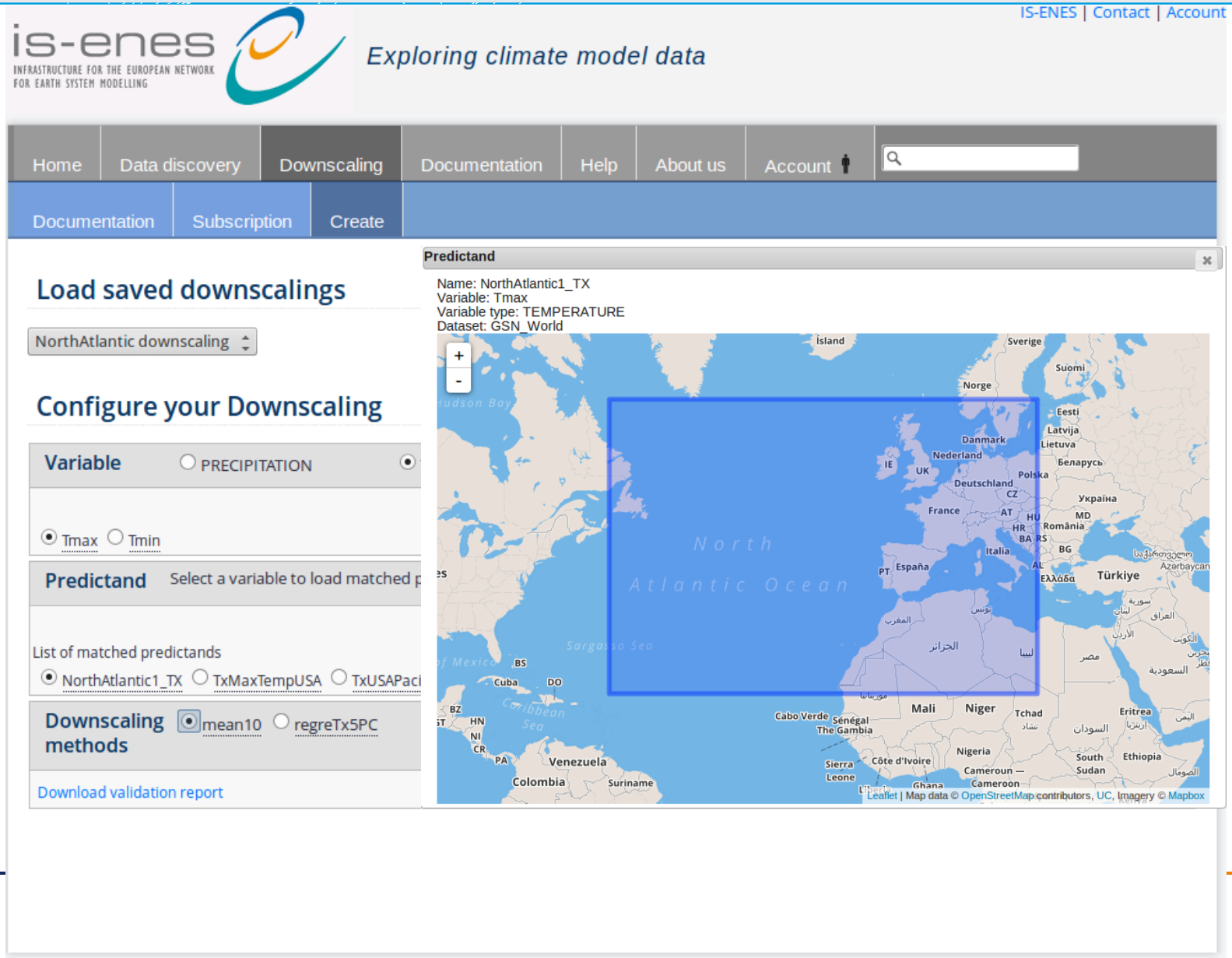


Concentration of sea ice for 2014-11-13

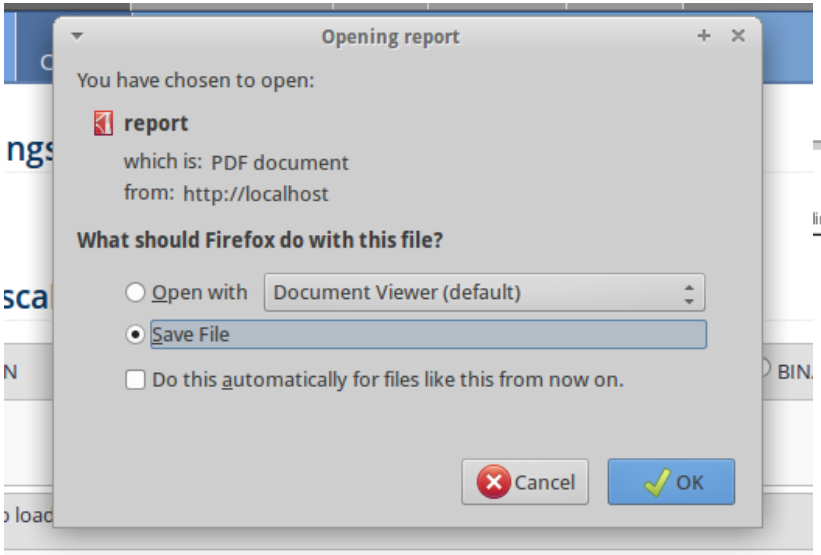
C4I On-Demand Statistical Downscaling

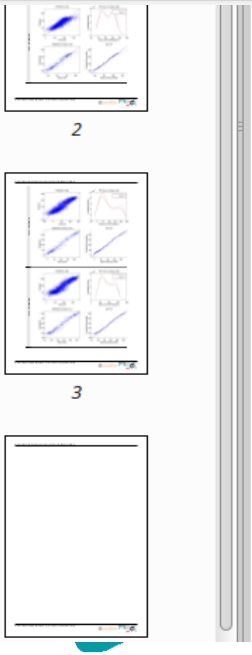


C4I On-Demand Statistical Downscaling



C4I On-Demand Statistical Downscaling





ling portal validation report. Generated on 14/10/2014 10:38:21

Validation of the statistical downscaling method mean10
for predictor NortAtlantic1 and predictand NorthAtlantic1_TX

Predictor details: Dataset: ERA40 (ERA40) Area: lon: -60.0Âº:10.0Âº:20.0Âº lat: 20.0Âº:10.0Âº:60.0Âº Period from 01/ene/1961 to 31/dic/2000 Variables (code, level, time): SLPd | 2D | 0 | 0 Z | 500 | 0 | 0 SLPd | 2D | 0 | 0	Predictand details: Dataset: GSN_World) Variable: Tmax Stations: 0 (see table below) 	Downscaling method: Description: Family: Non-Generative (algorithmic) Type: Analogues Parameters: InferenceMethod: mean AnalogueNumber: 10

Daily Validation: observations

Station	Missing	Mean	Median	Sigma	IQR	Min	Max	Pct01	Pct05	Pct10	Pct90	Pct95	Pct99
64300008027	0	162,553	164	56,714	85	-8	364	41,76	74	92	233	254	306
64300008202	0	181,464	174	84,642	142	-20	382	26	58	76	302	322	346,84
64300008215	0	98,652	88	84,495	140	-102	318	-58	-22	-4	222	240	268

Daily Validation: predictions

Station	Missing	Mean	Median	Sigma	IQR	Min	Max	Pct01	Pct05	Pct10	Pct90	Pct95	Pct99
64300008027	0	165,236	166,1	47,416	79,9	26	292,1	71,34	91,56	102,6	226,17	235,26	254,612
64300008202	0	187,541	175,05	77,917	145,95	46,2	346,3	64,958	82,99	93,8	297,1	309,22	326,926
64300008215	0	105,386	89,35	76,513	137,8	-42,4	265,1	-19,632	2	13,33	217,27	228,6	245,716

Daily Validation: accuracy

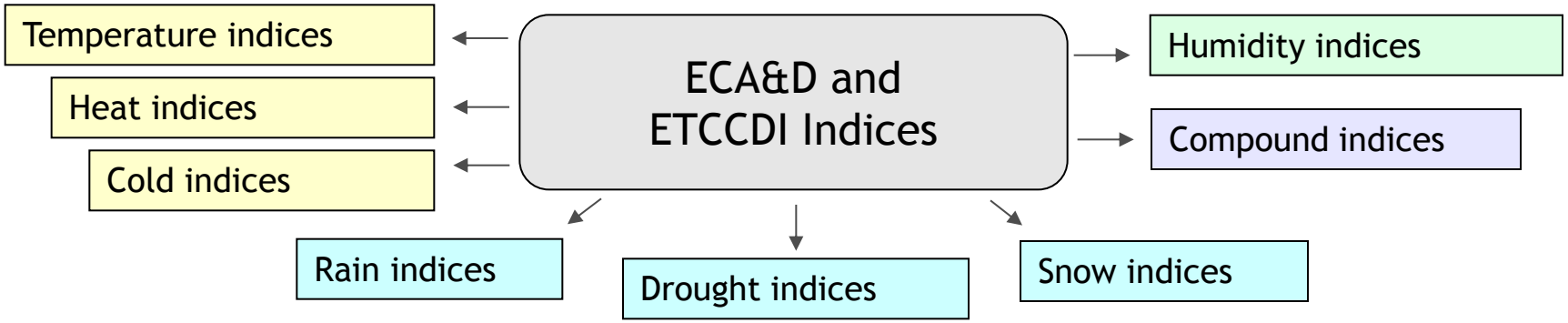
Station	MAE	MAE/Std	MAE/IQR	RMSE	RMSE/Std	RMSE/IQR	MAE/Mean	Spearman	Pearson
64300008027	21,44	0,378	0,252	27,817	0,49	0,327	0,132	0,886	0,874
64300008202	25,423	0,3	0,179	32,497	0,384	0,229	0,14	0,922	0,926
64300008215	25,956	0,307	0,185	33,087	0,392	0,236	0,263	0,919	0,924

C4I Processing Services

- Calculating Climate Indices and Simple Statistics
  - Uses PyWPS and ICCLIM
  - User interface is build *automatically* based on DescribeProcess XML file.
  - Interface supports:
    - Link to basket
    - Boolean elements
    - Comboboxes / select from list
    - Strings/text elements
  - IS-ENES2 is working on an indices wizard for user friendly indices calculation
  - Climate4impact WPS can be interfaced to other processing packages (cdo, NCL, ...)

On-demand Calculations

Climate indices calculation in climate4impact: **icclim**



- Intra-period extreme temperature range [° C] - **ETR**
- Warm days (days with mean temperature > 90th percentile of daily mean temperature) - **TG90p**
- Summer days (days with max temperature > 25 ° C) - **SU**
- ...

- Python code developed at Cerfacs since September 2013 (EU FP7 IS-ENES2)
  - Generic and modular approach, can be reused in other environments
  - C functions called for optimization
- I/O interface is structured for optimal performance, with wrapper functions and dynamic chunking
- Gives support to climate indices calculations in OpenClimateGIS (ocgis)

Use a processor

Processing details and options

Title:	WPS for multivariable indice
Identifier:	wps_multivar_indice
Abstract:	WPS for multivariable indices
Location:	/impactportal/WPS?service=WPS&version=1.0.0&request=describeprocess&identifier=wps_multivar_indice

Start proc

Options

Indice name

ETR

Variable name to process (daily max temperature)

tasmax

Input netCDF files list (daily min temperature)

http://opendap.knmi.nl/knmi/thredds/dodsC/IS-ENES/TESTSETS/tasmin_day_EC-EARTH_rcp26_r8i1p1_20060101-20251231.nc

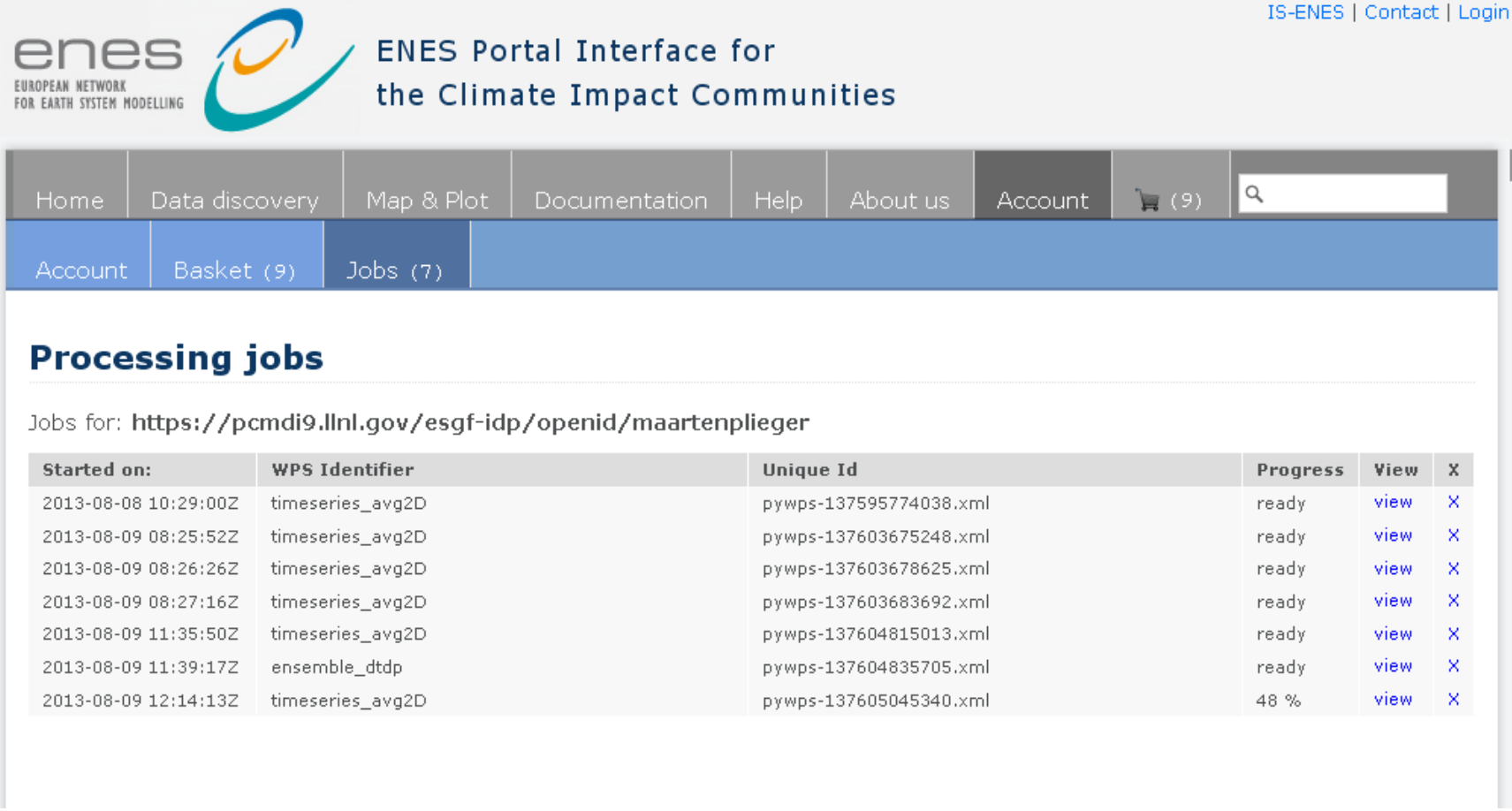
http://opendap.knmi.nl/knmi/thredds/dodsC/IS-ENES/TESTSETS/tasmin_day_EC-EARTH_rcp26_r8i1p1_20260101-20501231.nc

http://opendap.knmi.nl/knmi/thredds/dodsC/IS-ENES/TESTSETS/tasmin_day_EC-EARTH_rcp26_r8i1p1_20510101-20751231.nc

http://opendap.knmi.nl/knmi/thredds/dodsC/IS-ENES/TESTSETS/tasmin_day_EC-EARTH_rcp26_r8i1p1_20760101-21001231.nc

Time range, e.g. 2010-01-01/2012-12-31

Processing Jobs (asynchronous)



C4I: WPS Further Infrastructure integration

- Some data intensive calculations will be delegated and performed near the data storage, as much as possible

- ESGF Compute Working Team (CWT)
  - Compute Nodes along Data Nodes
  - Future ESGF API for federated data processing execution, using WPS
  - Supports for many processing libraries and package

Conclusions

- ESGF is a great tool for distributed data access
  - Search works great
  - But security is complex (OpenID, MyProxy, SSL, ports, delegation issues, etc…)
- Climate4Impact makes extensive use of ESGF services
  - Search, OPeNDAP, Security
- Climate4impact is flexible due to applied technologies
  - Web Processing Service (PyWPS), Web Map Service (ADAGUC), OPeNDAP (THREDDS)

Conclusions

- ADAGUC WMS can be used to visualize local and remote files
- PyWPS with ICCLIM is suitable as a generic processing framework for climate indices (and soon climate indicators FP7 CLIPC)
- OPeNDAP can be used to access small bits of large files over the internet quickly

Next steps

- Improve user interface → make more user friendly
- Finalize the connection to the University of Cantabria downscaling portal
- Climate indices calculation wizard
- Roadmap will be updated at next C4I Coding Sprint (April 2015)

Time for questions & comments!

https://verc.enes.org/ISENES2

http://climate4impact.eu/

http://icclim.readthedocs.org/

https://github.com/tatarinova/icclim